

CLAIMS

1. (Amended) A multi-layer laminated circuit board characterized in comprising:

an in-built multi-layer transformer formed by

5       laminating a primary winding and a secondary winding, a dielectric sheet constituted by a non-magnetic body, and magnetic sheets provided so as to sandwich said dielectric sheet and forming a core via a central through hole formed in said dielectric sheet and a peripheral edge of said dielectric sheet; and

10       a wiring sheet formed with a circuit pattern.

2.       The multi-layer laminated circuit board according to claim 1, wherein said wiring sheet is laminated onto an upper surface or a lower surface of said multi-layer transformer.

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3.       The multi-layer laminated circuit board according to claim 1 or claim 2, wherein said multi-layer transformer is provided on a part of said wiring sheet.

20       4.       The multi-layer laminated circuit board according to any of claims 1 through 3, further comprising a laminated component sheet formed with a laminated component.

25       5.       The multi-layer laminated circuit board according to any of claims 1 through 4, wherein a thick film, a passive chip element, and an active chip element are mounted on a top surface thereof.

30       6.       The multi-layer laminated circuit board according to any of claims 1 through 5, wherein said multi-layer transformer is constituted by a laminated body comprising:

a first magnetic sheet;

a first dielectric sheet laminated onto said first magnetic sheet and constituted by a non-magnetic body having a through hole formed in a center thereof;

5 a first winding positioned around said through hole on said first dielectric sheet and constituted by one or both of a primary winding and a secondary winding;

10 a second magnetic sheet laminated onto said first winding so as to contact said first magnetic sheet on a peripheral edge of and through said through hole in said first dielectric sheet;

15 a second dielectric sheet laminated onto said second magnetic sheet and constituted by a non-magnetic body having a through hole formed in a center thereof;

20 a second winding positioned around said through hole on said second dielectric sheet and constituted by the other of, or both of, said primary winding and said secondary winding; and

25 a third magnetic sheet laminated onto said second winding so as to contact said second magnetic sheet on a peripheral edge of and through said through hole in said second dielectric sheet.

7. The multi-layer laminated circuit board according to claim 6, wherein said multi-layer transformer is formed by laminating together a plurality of said laminated bodies such that said third magnetic sheet, excluding said third magnetic sheet on an upper end, doubles as said first magnetic sheet of a laminated body thereabove.

30 8. The multi-layer laminated circuit board according to any

of claims 1 through 5, wherein said multi-layer transformer comprises:

a dielectric sheet constituted by a non-magnetic body having a through hole formed in a center thereof;

5 a first winding positioned on one surface of said dielectric sheet and around said through hole, and constituted by one or both of a primary winding and a secondary winding;

10 a second winding positioned on the other surface of said dielectric sheet and around said through hole, and constituted by the other of, or both of, said primary winding and said secondary winding; and

15 a pair of magnetic sheets sandwiching said dielectric sheet, said first winding, and said second winding, and contacting each other on a peripheral edge of and through said through hole in said dielectric sheet.

9. The multi-layer laminated circuit board according to claim 8, wherein said multi-layer transformer further comprises a magnetic frame aligned with said peripheral edge of said dielectric sheet and a magnetic core aligned with said through hole, and  
20 said pair of magnetic sheets sandwich said dielectric sheet and contact each other via said magnetic frame and said magnetic core.

25 10. The multi-layer laminated circuit board according to claim 9, wherein said magnetic frame and said magnetic core are connected to each other via a support portion to form a magnetic sheet.

11. The multi-layer laminated circuit board according to any  
30 of claims 1 through 5, wherein said multi-layer transformer

comprises:

a composite sheet having a magnetic pattern in a center and on a peripheral edge thereof, and a dielectric pattern constituted by a non-magnetic body in parts other than said center  
5 and said peripheral edge;

a first winding positioned on one surface of said dielectric pattern and around said center, and constituted by one or both of a primary winding and a secondary winding;

10 a second winding positioned on the other surface of said dielectric pattern and around said center, and constituted by the other of, or both of, said primary winding and said secondary winding; and

15 a pair of magnetic sheets sandwiching said composite sheet, said first winding, and said second winding, and contacting each other via said magnetic patterns.

12. The multi-layer laminated circuit board according to claim 11, wherein, in said multi-layer transformer, a composite sheet having a magnetic pattern in a center and on a peripheral edge thereof, and a dielectric pattern constituted by a non-magnetic body in parts other than said center and said peripheral edge, is interposed between said first winding or said second winding and said magnetic sheets.

25 13. The multi-layer laminated circuit board according to claim 11 or claim 12, wherein, on said composite sheet, a film thickness of said magnetic patterns is equal to a film thickness of said dielectric pattern.